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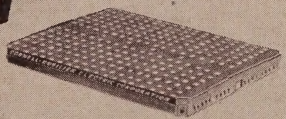
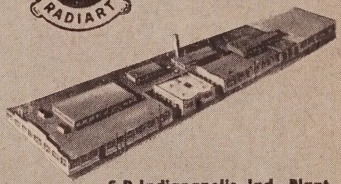


C-D Fuquay Springs Division, N. C.



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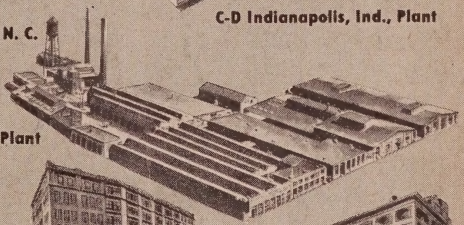

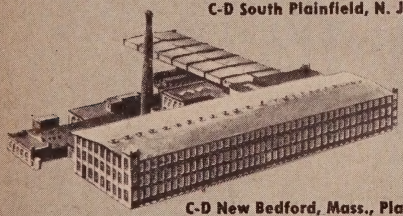

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Vol. 17 JUNE, 1952 No. 6

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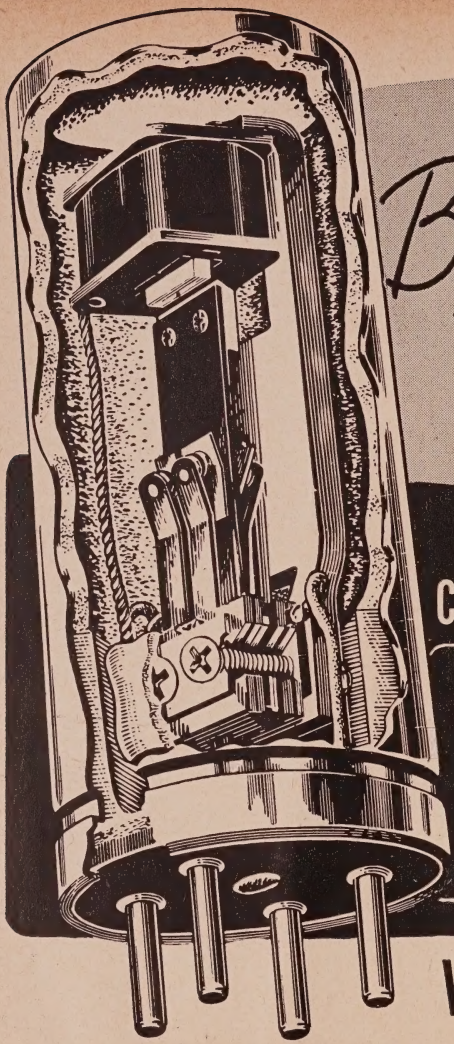

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The display of response curves of circuits or components on an oscilloscope screen saves many hours of tedious point-by-point plotting of data. Visual alignment of radio and television receivers has brought this technique into widespread general use. With an entire response curve visible at one time, the technician is able to observe immediately the effects of adjustments and circuit repairs.

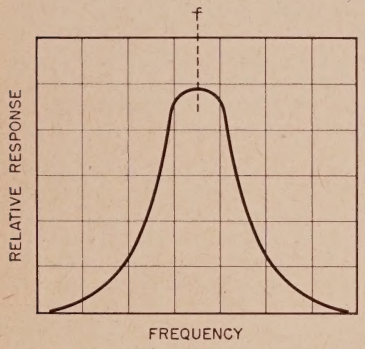

Fig. 1. Typical Visual Response Pattern.

In circuit and component alignment patterns (response curves), signal amplitudes are indicated along the vertical axis of the oscilloscope screen, and frequencies along the horizontal axis. Such a pattern is shown in Figure 1. This might be the response curve of a single tuned circuit or of an r.f. or i.f. amplifier stage. The pattern is obtained by coupling a frequency-modulated r.f. test signal, having a center frequency f, into the circuit under test; and taking the output signal from across the circuit, demodulating it, and presenting the demodulated product to the vertical amplifier input of the oscilloscope. The vertical units and their spread are identified readily by means of a vertical voltage calibration of the oscilloscope screen. But no such simple identification of frequencies along the horizontal axis ordinarily is possible. This introduces the necessity for a means of "marking" the frequency corresponding to any point of interest along the response curve.

Two methods of signal marking are in use. Each ordinarily utilizes an auxiliary instrument in conjunction with the frequency-modulated sweep generator, although a few sweep generators have built-in marker devices. One produces a pip or squiggle (See Figure 2A); the other a dip (See Figure 2B) on the response curve. The frequency corresponding to the point on the curve at which the marker appears is read from the dial of the marker-generating instrument.

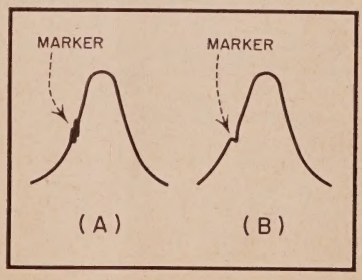

Fig. 2. Types of Markers.

The pip-type marker is produced by beating an unmodulated r.f. oscillator or signal generator against the sweep.

generator by applying the two generator output voltages simultaneously to the circuit under test. Figure 3 shows the instrument setup. A beat note occurs each time the sweep generator

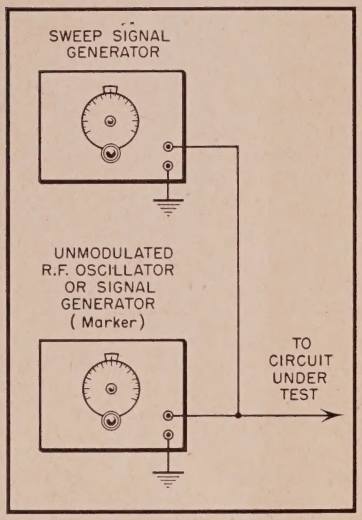

Fig. 3. Setup for Pip-Type Markers.

frequency passes through the frequency of the marker generator. This beat note phenomenon is what is seen as a pip on the displayed curve. If the spot-like pip is expanded on the screen, it will be seen to be composed of a group of low-frequency cycles. The frequency marked on the curve by the pip is read from the dial of the marker generator.

The dip-type marker is produced by a coil-capacitor wavetrap circuit connected between the sweep generator and the circuit under test. Figure 4 shows the instrument setup. The wavetrap absorbs a small amount of energy from the sweep generator signal each time the latter passes through the resonant frequency of the wavetrap. This causes the dip on the displayed curve at a point corresponding to the frequency to which the trap is tuned. The trap consists of a fixed coil and variable capacitor, and is tuned by varying the latter. The capacitor dial is graduated in kilocycles or megacycles. The frequency marked on the displayed curve is read from this dial. A wide tuning range may be covered by switching coils.

Whichever method is used, tuning the marker generator will move the marker along the curve to any desired point. The frequency at that point then may be determined from the setting of the marker generator.

The use of markers is very important in television receiver adjustment, since the wide-band receiver circuits must be aligned to give certain prescribed response at stated frequencies. These frequencies must be identified accurately along the response curve. Figure 5 shows a representative video i.f. response curve, as it would be displayed on an oscilloscope screen, with marker pips at important check points. The marker may be placed also at points other than those shown in the illustration; for example, at either of the peaks or at the dip between them.

Correct Method of Marker Operation

The size of the marker pip on the displayed curve is proportional to the output voltage of the marker generator. When this output is high, the marker will be spread over a large portion of the curve. The latter condition is undesirable, because it makes difficult the location of the exact spot on the curve which corresponds to the marker frequency. A strong marker signal also distorts a large portion of the pattern, giving a false impression of the response of the circuit under test. It follows then that the marker

generator output always must be reduced to the lowest level which will produce a marker point just discernible on the curve.

the high-lead to the glass envelope of the tube in the stage under test. Another accepted practice is to feed the marker signal into the stage immedi-

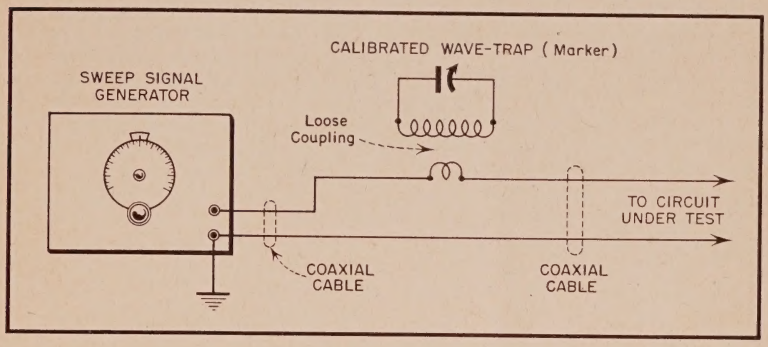

Fig. 4. Setup for Dip-Type Markers.

In many sensitive t.v. circuits, such as front ends and i.f. amplifiers, sufficient marker signal voltage may be obtained without an actual conductive connection to the marker generator. For example, the "high" output lead of the marker generator often may be

ately preceding the one to which the sweep generator is connected.

The size of the marker dip produced by a wavetrap-type marker device, (Figure 4) is proportional to the coupling between the two coils. When this coupling is tight, the dip will be too wide

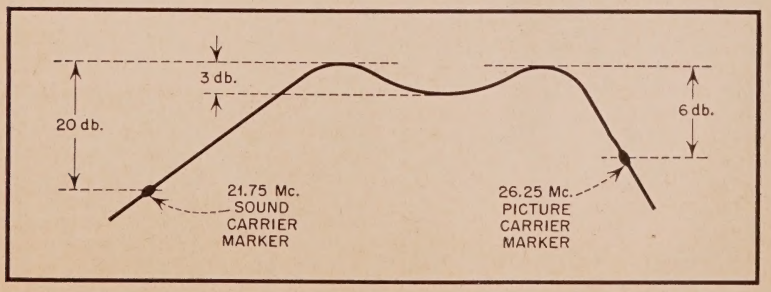

Fig. 5. Video I. F. Curve with Markers.

laid close to the point to which the sweep signal generator is connected, and enough signal picked up by the circuit under test. Some technicians tie

to permit accurate identification of the marked point on the observed curve, and the response curve is apt to be distorted to such an extent as to give

a false impression of the circuit response. In Figure 4, the coupling is indicated as loose for these reasons.

A variable-frequency self-excited oscillator should not be used to supply the 4.5-megacycle marker signal for use in adjusting the sound i.f. and detector circuits of an intercarrier-type television receiver. Only a zero-drift 4.5-Mc. crystal oscillator is satisfactory for this purpose, since the accuracy of most self-excited oscillators is inadequate. For example: a frequency accuracy of 1 percent would be entirely satisfactory for many purposes, but at 4.5-Mc., 1% is 45 kc., and the frequency-modulated sound bandwidth is only 25 kc. plus and minus.

In order to secure satisfactory performance without interaction between units and extraneous pickup, the marker generator, sweep signal generator, and receiver under test **must** have an efficient common ground connection. The shield braids of the generator cables must not be relied upon to supply this connection; but instead, a

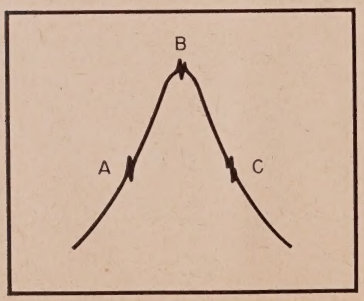

Fig. 6. Marker Positions on Resonance Curve.

heavy bond of copper strip should be run between the ground terminals of the generators and receiver. An added advantage is obtained by employing a grounded-sheet copper bench plate on which the instruments and receiver are placed.

Marker Generator Coverage

Since the pip-type marker generator is an unmodulated variable-frequency oscillator (often combined also with a crystal oscillator), its frequency range can be made to cover all i.f. and front-end frequencies used in f.m. and t.v. receivers. An example of such an instrument is the special marker generator Sylvania Type 501. The variable-frequency oscillator in this instrument covers the range 15 to 240 megacycles in four bands. The crystal-controlled oscillator will handle any crystal between 2 and 20 Mc. and, of course, will supply harmonics of the crystal frequency.

The dip-type marker device, being a wavetrap, is susceptible to the detuning and loading effects of stray circuit capacitances and shunt coupling capacitances. For that reason, this type of instrument seldom is used much beyond the range of t.v. intermediate frequencies, the top frequency usually being between 30 and 40 Mc.

Harmonics, as well as fundamental frequencies of the pip-type marker are readily useable as markers. Some technicians favor harmonics because of their reduced signal level which produces a smaller, cleaner marker without requiring "hair-trigger" adjustment of the generator output control.

Marking Techniques

There are two general methods of employing marker signals: (1) to set the frequency to which response of the circuit under test is to be aligned visually; and (2) to identify frequency points along the response curve.

In the first case, the marker generator is set to the desired frequency obtained from the receiver alignment instructions. For example, this may be

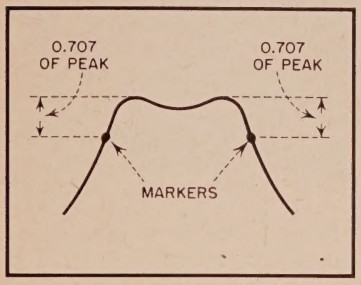

Fig. 7. Marker Positions to Show Bandpass.

the center frequency of an a.m. intermediate-frequency channel, in which case the curve then would be inspected to determine if the marker is at the peak of the curve. If it is not in the peak position, stage trimmers must be adjusted for coincidence of marker and peak. Figure 6 shows typical possible positions of the marker along an i.f. or r.f. response curve. The proper position of the marker is at peak response, B. If the marker is at A or C, the stage is aligned incorrectly.

In the second case, the marker is moved along the curve, by tuning the marker generator, and stopped at a point of interest. The frequency corresponding to that point then is read from the marker generator. An example is examination of video i.f. response (See Figure 5). The marker is set successively to the 21.75-Mc. sound carrier and 26.25-Mc. picture carrier frequencies. The proper amplitude of these points (shown in Figure 5 as decibels below peak response) is obtained from the receiver manufacturer's alignment data. If the proper amplitude-vs-frequency relations are not obtained, the trimmers must be adjusted for correction of the condition. The bandpass characteristics of a transformer or amplifier may be checked in a similar fashion. Figure 7 shows a bandpass response curve. The marker is set successively to a point on each skirt of the curve 70.7% of the peak response amplitude ("half-power" points). The two corresponding frequencies are noted from the marker generator, and the bandwidth determined by subtracting the lower from the higher frequency. The broad-band r.f. and i.f. amplifiers in high-fidelity a.m. receivers may be inspected and adjusted in this manner.

Correct alignment of f.m. sound detectors may be verified by means of a marker shifted along the typical discriminator or ratio detector response curve. The point at which the marker appears (when the marker generator is set for the center frequency of the f.m. intermediate-frequency channel) should be the center of the response

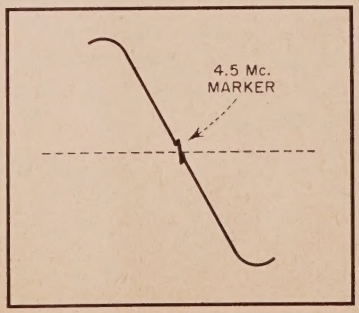

Fig. 8. Marker Position on Sound Detector Curve.

curve (See Figure 8). In an intercarrier-type t.v. receiver, this frequency is 4.5-Mc. In a standard f.m. receiver, it is 10.7-Mc.

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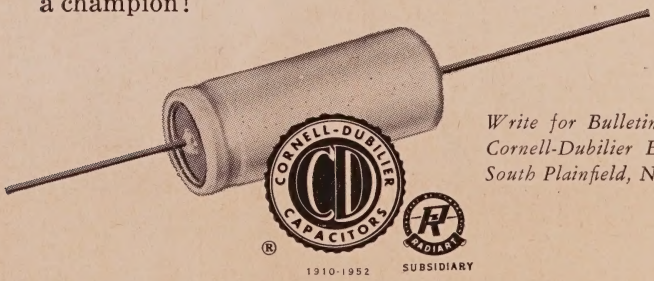

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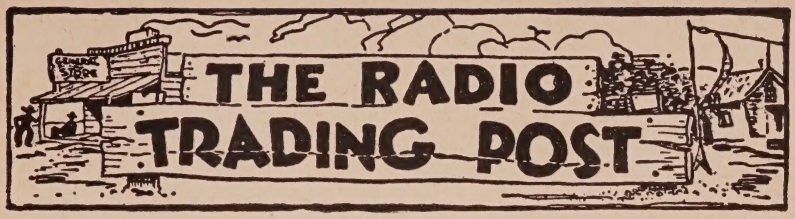

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WANTED—Morse G3 tank, BA1A 16mm action viewer, other photo equip. Trade tubes, meters, mike, guns. P. Dinger, 9751 S. Dobson, Chicago 28, Ill.

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FOR SALE—Code oscillator for AC or DC, perf. cond. Sent postpaid with key and ear phone for $5.50 M. O. Thomas Johnson, Box 932, Tuscaloosa, Ala.

SWAP—Dual speed GI recording and playback unit; 15W hi-fi amplifier. Want printing press, 5 x 8 preferably; also lens in shutter for 4 x 5 or 5 x 7 press camera. Maurice Gillette, Box 32, Scanlon, Minn.

FOR SALE—National comm. rec. N.C. 100 XA, fine cond. $65 with matching speaker; Lettine 240 transmitter, xtal, crystal mike, spare tubes, like new $75. Dave Siegel, 43 Webster Ave., Bklyn. 30, N. Y.

SELL OR TRADE—S-19 Sky Buddy; RCA wire recording head with oscillator coil; 5 x 7 view camera; Log log duplex slide rule and Dietzgen Commander set of drawing instruments. Want SX28 and Eico scope mod. 425. Clyde F. Watts, 218 Lincoln, Wayne, Neb.

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WANTED—Navy RAL-7 rec. and control box; must be in good cond. Thomas J. O'Donnell, 47 Francis Ave., Hamden 14, Conn.

FOR SALE—Repair business setup; work bench with drawers, shelves, AM-FM oscillator, meters, testers, tubes, vibrators, high and low volt filter condensers etc.; sac. $200; Airline 10" console, 21 tubes, perf. $79. John Meek, 5619 W. Chicago, Detroit 4, Mich.

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SWAP—Shure mod. 55; Electro Voice mod. 950 mike; Vomax 900 VOM; Clough Brengle analyzer; Dumont T4A4 tuner; Pilot V101 transceiver. Want test equip. or tubes. Bill Bockman, 400 Single Ave., Collins Park, Newcastle, Del.

FOR SALE—Elgin tube tester and carrying case; tests 187 types of tubes and shorts. Perf. cond. $8, you pay postage. Milton Charnick, 2082 Crotona Pkwy., Bronx 60, N. Y.

FOR SALE—Rider Man. 7-12, good as new. $5 ea. Geo. W. Howerton, 8 S. Bedford Ave., Evansville 11, Ind.

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WANTED—TV or radio course; also testing equipment. O. J. Demarest, 89 West St., Green Island, N. Y.

FOR SALE—Radio-TV Sales, Service business, est. 20 yrs., 2000 customers; stock, tools, equipment, etc.; 3 rm. apt., steam, hot water—rental $50. All $3500. Can make back in 8 mos. Martin Funk, 114 Ralph Ave., Brooklyn 21, N. Y.

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FOR SALE—Heathkit 0-6 scope, wired and in working order $27.50; WE 728B 12" speaker $28; Green Flyer 78-33⅓ phono motor $4; BC-433 rec. $14. J. H. Schultz, 1225 N. Franklin, Springfield, Ill.

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FOR SALE OR TRADE—Hammarlund Super Pro comm. rec. comp. in orig. cartons; exc. cond., will sell to highest bidder or trade for good TV test equip. Art's Radio Service, 2423 S. Selby St., Marion, Ind.

FOR SALE OR TRADE—Karl Zeiss-Ikonta B camera, 2¼ x 2¼, best lens, comp. with Kalart master flash gun and case; AC gen.; Wilcox Gay recorder. Will trade for Tv set. Tommy Thompson, P. O. Box 330, Fayetteville, Tenn.

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SWAP—16 jewel Gruen Curvex wrist watch $60 value, like new; also Hugo Rauner's Bergrauner Chromatic harmonica. Want good tube checker or voltmeter. Louis J. Lantosh, 472 Bostwick Ave., Bridgeport 5, Conn.

FOR SALE—Adapter plates permitting use of Motorola auto radios in '51 Chryslers $2.95 ea., pp. Has custom look. Cherry Radio Co., 1438 Belfield Ave., Philadelphia 40, Pa.

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WANTED—Rider vol. 12, 13, and 14. State cond. and price. J. D. Jaqua, Holloway, Mich.

WANTED—Instruction man. or circuit diagram 1D-6A/APN4, borrow or buy. Paul Howcroft, 122 Bracewell Ave., North Adams, Mass.

SELL OR TRADE—Books, text, history, poetry, literature, technical, misc. to trade for electronic eqpt. or sell for cash. Send stamp for list. All fair to new condition. R. P. Anderson, 6018 Henderson St., Chicago 34, Ill.

FOR SALE—Mod. 560 port. Hickok tube tester; Philco 066 sig. gen.; GE VOM, all for $75. Verne Wilson, Mackinaw City, Mich.

FOR SALE—Sam's Photofacts 1-50, 75 and 76 with 4 binders; Masco 35W amp. with automatic turntable, crystal mike, 2 Jensen speakers, 2 tri-stands, mike stand and cable; about 500 tubes and ballasts. Elmer Haye, 111-62 144 St., Jamaica 4, N. Y.

TRADE—WE dynamic microphone valued at $110 for either Heathkit or Eico scope or mod. SW-54 National comm. rec. Howard J. Haftel, 1651 Montgomery Ave., Bronx 53, N. Y.

FOR SALE OR SWAP—BC-406, ARB rec., short wave set and coils for 10-200 m.; also scope and VTVM and many other articles. Want PA eqpt. Write for list. F. W. Bearinger, Box 56, Denver, Pa.

FOR SALE—Heathkit tube checker, $20; Heathkit cond. checker $15; Heathkit VTVM $17.50; Heathkit bat. eliminator $17.50; Eico sig. gen. $15; all like new. Chares E. Lester, 423 River Ave., Weston, W. Va.

TRADE—Soldering gun Weller or TV tube adapter for Triplett 3413; Zenith AM-FM mod. 7H920 or G725 H.V. probe for RCA 195A, front end RCA KRK5A, Rider 18 and up. G. H. Swiska, 109 E. School St., Woonsocket, R. I.

SWAP—Superior model 450 tube tester, AC portable snap cover, in good cond. Want VOM or Hallicrafters S-38, in good cond. Jesse Ramey, 1309 Leeson Ave., Cadillac, Mich.

WANTED—FM tuners; also AM-FM receivers. State lowest price or what is wanted in exchange. G. Barto, 1317 Cole St., Wilkinsburg, Pa.

TRADE—RCA TRK12 12" comb., new 12 chan. turret tuner, high fidelity all band radio pushpull aduio, 2 spare 12" picture tubes. Sell or trade for HT9 or TBS50. A. F. Popelarski, 6029 67th Pl., Riverdale, Md.

POSITION WANTED—First class "phone" man, inexp. in broadcasting, but associated with radio field for 9 yrs. Send full details as to pay, working hours, etc. Wayne W. King, 814 N. 3rd Ave., Knoxville, Tenn.

FOR SALE OR TRADE—2000W 115V DC 1080 rpm gen. comp. with rheostat and voltmeter $100 FOB or will take test eqpt., recorders (wire, tape or record) or woodworking machines. Loren Parker, Rt. 5, Grant Rd., Wenatchee, Wash.

WANTED—Corres. course in radio engineering, pref. from CREI; all réplies acknowledged. Nelson J. Christenson, 51 Cherry Ave., Cornwall-on-Hudson, N. Y.

FOR SALE—One WE mod. 19A transmitter, aircraft type, 12V. DC power supply, less crystals; WE mod. 227D transmitter-rec., 6V. DC, marine type, with crystals; exc. cond., best offer. Raymond H. Ives, 663 Kempsville Rd., Norfolk 2, Va.

WANTED—New or used metal and plastic inside auto radio knobs, used on concentric shafts. Will pay cash or trade. Gerald Kernan, Harpers Ferry, Iowa.

FOR SALE OR TRADE—Sprague Telohmike Resistor condenser tester. Heathkit sig. gen. (ass'd); John Meck mutual conductance tube tester. Sprayberry radio-TV course complete with parts for kits. E. J. Kostelnak, 5033 S. Seeley Ave., Chicago 9, Ill.

WANTED—Rider TV man. from vol 1 to present in good cond. Stan's Radio and Television, 9 Carlisle St., Roxbury 21, Mass.

SALE OR SWAP—16mm sound projector for scope, sig. gen. or ham equipment. All letters answered. Arnold L. Halpern, 450 Brighton Ave., Long Branch, N. J.

FOR SALE—Rider Mans.; all TV and radio test equip. Perf. cond., very reas. E. D. Dixon, 170 S. Preston St., Centerburg, Ohio.

FOR SALE OR TRADE—Solar 2-3 enlarger, like new; Weston exposure meter and panel meters 0-50 KW, 0-1000 peak watts, 0-30 D.C.V., and four 0-1.0 milliameters. Louis Altman, 959 Utica Ave., Bklyn 3, N. Y.

SELL OR SWAP—630 chassis with 15" tube $75; Heathkit TS1 sweep gen. (factory calibrated) $35; Philco 077 RF gen. $20; Rider TV man. no. 1 $10; RCA 155A scope $60. All in good cond. Vincent Iavarone, 1218 Leland Ave., Bronx 71, N. Y., N. Y.

WANTED—Radio-TV course. Will pay cash or swap for radio eqpt. Navas Radio Service, 69 Bank St., New York 14, N. Y.

SWAP—Want Collins VFO with slide rule dial 813, 828, electronic key. Have 300W mod. xfrmr 810s, 304TLs, kw final, 1250V 800MA (DC) CCS xfrmr 2-10mfd 200V cond, 1 amp. swing choke. Other hi-power eqpt. W. E. Jamison, 2500 Battery, Little Rock, Ark.

WANTED—FM tuner. Send price, make, and tech. info. to Leo Lukianoff, 308 E. 8th St., N. Y. 9, N. Y.

FOR SALE—Sprague mod. To-3 capacitor analyzer, never used, $60 FOB. C. H. Connor, 231 E. Huron St., Chicago 11, Ill.

FOR SALE OR SWAP—Solar capacitor Exam-eter mod. CF-1-60, exc. cond. Will trade for 8mm movie proj. in like cond. Dave Myers, 630 N. 5th St., Springfield, Ill.

WANTED—Coils for Silver 801 H.F. rec. Need 1 pr. ea. no. 125-B6, 19-36 mc; no. 125-B7, 35-63 mc. Pay $1 ea. H. M. Reavis, 1416 Calumet Ave., Los Angeles 26, Calif.

FOR SALE—50L6; 35Z5; 12SK7; 12SA7; 12-SQ7, $4.20 postpaid. John Kennedy, 4416 Memphis Ave., Cleveland 9, Ohio.

WANTED—Multimatch class B input and output mod. transformers, 250 to 350W. Also comm. rec. in A-1 cond. Daugherty Radio, 5020 Hohen St., Dallas, Tex.

FOR SALE—Emission tube and set tester, tests condensers and TV tubes, $25. W. Siuta, 4011 Lawndale St., Detroit 10, Mich.

SELL OR TRADE—Rider vol. 8-14 in perfect shape. Trade for test instruments or cash, tubes, etc. Make offer. William Shope, 944 Chestnut St., Jeffersonville, Ind.

SELL OR TRADE—Tone camera, anastigmat 1 3.5 F, 25mm lens with case. Trade for binocular-telescope or tube tester. Alex Poch, Box 174, Dillonvale, Ohio.

SELL OR TRADE—Mod. 68 tube tester, never used, Triplett; tests all tubes; Jackson mod. 650 cond. tester; hard to get tubes; what have you? Bell, Sta. H, Box 815, Los Angeles, Calif.

SELL OR TRADE—NRI TV set and adv. course with man. and comp. rec., cost $165; make offer. Want cash and/or scope. TV set considered. J. St. Johns, 2858 Lake Ave., Baltimore 13, Md.

SELL OR SWAP—BC 455 B, like new $10; National SW 3 like new, power supply 10 and 20 meter coils $15; Electro Voice dynamic mike cord and plug mod. 615, used very little $8. Want Bolsey 35mm camera. R. Hartman, 2401 Fourth Ave. South, St. Petersburg 7, Fla.

WANTED—Case for Emerson mod. 569,584 port. radio. Teletone mod. 152 port. radio. Dominic Bianchi, 338 Harris St., Kent, Ohio.

FOR SALE—Machine Shop Operations, by Amer. Tech. Soc. $4, like new; Hoag's Basic Radio $1.75, like new; Prentice-Hall's Radio Fund. $2.50; Nilson-Hornung's Practical Comm. $2.50. R. H. Cushing, 12 Carver St., Plymouth, Mass.

FOR SALE—General Radio AC-DC bridge; Weston 440 galvometer, mike hummer 1,000 Cy. comp.; Leeds-Northrup bridge DC from .001 ohm to 1 meg., like new; GE sine and square wave gen., like new. Henry Wagner, 4411 Indianapolis Blvd., East Chicago, Ind.

SELL OR TRADE—NRI sig. tracer, by Triplett. Used only a few hours. Will trade for sig. gen., or best cash offer. Stanley Bear, 79 Devens St., Greenfield, Mass.

SELL OR TRADE—EICO tube tester mod. 625 and VTVM mod. 221, both for $60 or will trade for 35mm camera. R. H. Sederholm, 5140 Upton Ave. S., Minneapolis 10, Minn.

FOR SALE—Sylvania polymeter type 134 and counter mod. tube tester type 139; sig. gen. Crystaliner mod. 201; sig. tracer mod. CA-12; adjust-a-volt transf. type LR-5; Triplett tube tester mod. 1212, all in good cond.; best offer. George McBride, Box 267, Harrods Creek, Ky.

SWAP—Have Burgess Vibratool, Handy Andy air compressor and spray gun with hose; Casco deluxe power tool with all acc. and case, all very good cond. Want good TV testing eqpt. Edward C. Kovach, 478 Gregory St., Bridgeport 4, Conn.

FOR SALE—T-23/ARC-5 transmitter with tubes, less crystals $20; MD-7/ARC-5 modulator with tubes $10; C-30/ARC-5 control box $2, all like new, 3 of each available. Ed. Mack, 82 Broadway, Bayonne, N. J.

WANTED—8" table saw with or without motor. Will trade tubes, parts, meters, 12" speaker, or what you need. Also have older mod. Hickok tube tester. Stephen W. Bieda, 29 Clareview, San Jose, Calif.

WANTED—12" or larger TV set, by aged couple on pension. Must be OK and cheap. Charles Willsey, 722 Charlotte St., Utica 2, N. Y.

FOR SALE—Rider man. 1-5 abr. and 6-14, 100% comp.; 10 vols., A-1 $100. RCA Chanalyst, inst. book, all leads, A-1 $100. Henry Nerkowitz, 22 Virginia Ave., Hempstead, L. I., N. Y.

FOR SALE—700W power transf., nine taps of 15V. each, exc. cond., best offer. Tom Faulkner, 1640 Westona Dr., Dayton 10, Ohio.

FOR SALE—Clarkston RV cartridge and needle $8; UTC output transf., type LS 55 $10; Webster-Chicago mod. 156 changer, tone arm conv. to use interchangeable plug-in heads; extra motor for 33⅓ $14. Edward F. Vanicek, 1265 Olmstead Ave., Bronx 61, N. Y.

WANTED—Disc recorder in oper. cond. Have .22 Colt on .38 frame with holster, like new. G. I. basic recorder-changer unit, new cutting head. James J. Winger, Box 112, Hutsonville, Ill.

FOR SALE—Testers, Rider man., parts, etc. of small radio business. Reasonable. Send for list. Rene Boucher, 13 Jackson Ave., Johnston, R. I.

FOR SALE—Radio Engineering, Terman 2d ed., like new $3; Math. for Radio and Comm., vol. 1 and 2 by Maedel $4; Cathode Ray Tube at Work, Rider $2. L. Matushefski, 2 Elmont Rd., Elmont, N. Y.

FOR SALE—3" RCA 155 oscilloscope $20; Clough-Brengle audio oscillator $20; BC-221 freq. meter $50; RME DB-20 preselector $17.50; FM Pilotuner $17.50. Fair condition, prepaid. Want metered 6-volt supply. Phil Hurst, 1309 Broadway, Lamar, Mo.

FOR SALE—Radio and TV sales and service, going concern, low rent, near new Queens 3000 family housing projects $500. D. Kellerman, 22-01 36 Ave., Long Island City 6, N. Y.

FOR SALE—Supreme 562 Audolyzer in very good cond. and Rider TV man. vol. 2, both for $90. Thomas W. Eckenberger, 12 Seaman Ave., N. Y. 34, N. Y.

WANTED—Test equipment; state cond., age, etc. Roland Stelzer, RD 2, Carlisle, Pa.

FOR SALE—Hallicrafter mod. S40A, exc. cond. $65. Chas. Cerami, 146 Congress St., Newark, N. J.

FOR SALE—Rider man. 7-14, record changer man. and Ghirardi's Trouble Shooter all for $80. Manuals like new. Steve J. Zvara, 6515 S. Danly Ave., Whittier, Cal.

WANTED—RCA 715-B2 oscilloscope; Dumont 294-A. Please state price and con. N. Kulke, 19620 Pasnow Ave., Euclid 19, Ohio.

WANTED—Aircraft receivers (AVR-100) or AVR-101) less power supply. Cash or trade. Louis F. Kralik, 522 Paine Ave., Toledo 5, Ohio.

FOR SALE—Vibroplex and Speed-X bugs, 2 meter gear, no. 78 Bud wavemeter, tubes, etc. Want Millen or Eldico grid dip meter. Mr. Alfred Freitag, 1437 Patapsco St., Baltimore 30, Md.

SELL OR SWAP—Late CREI radio course, $19; 2 transceivers, 2 receivers; 14W amp.; twin-track tape recorder; 16" TV tubes; 10" TV tubes. Want late model Heathkit or test eqpt. J. Bazewick, 3000 N. Christiana, Chicago 18, Ill.

TRADE—Transformers, condensers, chokes, AC relays, Underwood Stand. typewriter. Need tape or wire recorder, R 9'er, TBS-50, V70D tubes. W. Armstrong, 18425 4th S. W., Seattle 66, Wash.

WANTED—Push button car radio for '50 Chev. Delux, also Simpson 260. Joseph Rasulo, 1048 59 St., Brooklyn 19, N. Y.

WANTED—Tube tester and wireless intercom systems. Trade or sell 500W 110V 60 cycle AC gen.; few printing presses and typewriters. Ed. H. Showers, Sheridan, Lebanon County, Pa.

SELL OR SWAP—New Eico sweep gen. mod. 360K, comp. with all info.; Nilson and Hornung "Practical Radio Comm." 2nd ed. Irving Weiss, 504 B Grand St., N. Y. 2, N. Y.

FOR SALE—7" Motorola $35; radios, speakers and parts. Local dealer preferred. Len Sporn, 74 Belmont Ave., Paterson 2, N. J.

FOR SALE—Back issues of Electronics, '47 to '52; Proceedings of IRE, '47 to date; Nucleonics Audio Eng., April '48 through June '49; RCA Review. Edward Tanrath, 2621 S. Drake Ave., Chicago 23, Ill.

SELL OR TRADE—Bogen PA system mod. H623; 2 University trumpets and 25W drivers, like new; Pilot tuner; 10" Garod TV set with new tube. What have you? Irving N. Akers Radio Service, Rural Retreat, Va.

SELL OR TRADE—Plate power transformers, 2400V, 500MA $17 or ? Charles Buskirk, 809 E. Jackson St., Martinsville, Ind.

WANTED—Sweep gen. in good cond., also scope; known brand. Joseph Raisman, 1751 Georges Lane, Phila. 31, Pa.

FOR SALE—No. 450-A RCP Hi-meg. multitester, perf. cond. $12.50. Walz Radio & Appl. Service, 2533 Main, Joplin, Mo.

SWAP—Locally, SCR 522 unconverted and Navy tuning unit (osc., final and antenna) covering 1500-3000 kc for ham rec. Stenotype machine, used 2 wks., case, lessons and texts $75; worth $160. Frank Muoio, Ashland Ave., E. Orange, N. J.

SWAP OR SELL—Tube checkers, like new. Want hi-fi eqpt., amplifiers, speakers, turntables, arms, FM tuners, TV sets, ham receivers, binoculars, FM sig. gen. Milton Schiedel, 4250 Textile Rd., Ypsilanti, Mich.

FOR SALE—National NC-57B comm. rec. in exc. cond., used only a few hours. Price FOB $70. Harry M. Denison, 21 S. 4th St., Columbia, Pa

SELL OR TRADE—Mobile master mount or Jap Roico camera in fair shape; SX25 in fair cond. Prefer Chicago buyer who can pick it up near Hammond, Ind. Need test gear in good or fair cond. Sgt. Edward B. Ramirez, P.O. Box 516, Camarillo, Calif.

SWAP—4 x 5 Speed Graphic, coupled range finder, Graphex shutter good cond. for 16mm sound proj., short wave rec. or transmitter, war surplus rec. converted or what have you. Walter Steed, Jr., 3108 Oxford Ave., Nashville 6, Tenn.

WANTED—Citizen band transmitter, tape recorder. Mitchell Metzarek, 2174 N. Melvina Ave., Chicago 39, Ill.

WANTED—FM adapter for AM radio rec. Martin H. Kingsley, 36 Ellwood St., New York 34, N. Y.

TRADE—Old Kentucky squirrel rifle, Standard coil tuner, TV tubes and parts or cash for PA system, Shure mic., good VTVM, sig. gen. or tube checker and coin operated radios. D. Colaw, 702 N. Randolph St., Champaign, Ill.

FOR SALE — NRI Model 88 signal generator; Vol. 1, NRI service manual; Modern Radio Servicing (Ghirardi); 40 new popular standard brand receiver tubes. Best offer. Harold G. Brown, Box 80, Benton Station, Me.

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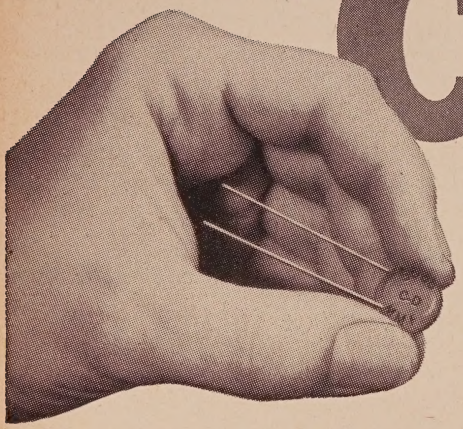

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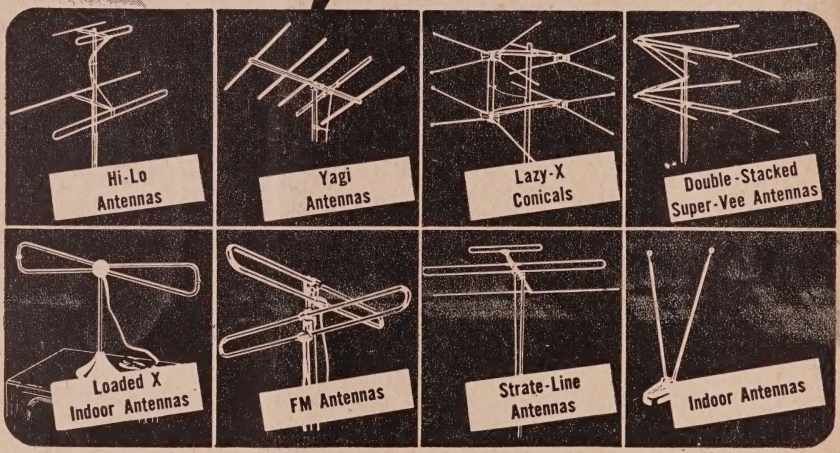

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